Education" a letter appeared in the *Times* of the 21st inst., which we print *in extenso* elsewhere. The main purpose of this second outcome is to show that at the present moment what is chiefly lacking in the army of peace is organisation and a proper headquarter staff—an Educational Commander-in-Chief. Reading between the lines of the letter, it is easy to see that one of the things "organisation" is expected to do, nay, must do, is to prevent so-called "economy" from thwarting every attempt at progress. "Economy does not lie in sparing money, but in spending it wisely," is a maxim that must be commended not only to the Treasury, but to local bodies.

It is probably the feeling that the proposals of a strong Minister of Education, with a full knowledge of his subject and in touch with all the most eminent educationalists of his time, would be sure to commend themselves to Parliament, and that the annual charge would be increased, which has induced successive Ministries to postpone the creation of such an office. It is now thirteen years since both the Duke of Devonshire's Commission and Parliament itself discussed the question; the latter on the motion of Mr. (now Sir Lyon) Playfair. Three years ago the Report of the Select Committee presided over by Mr. Childers unanimously recommended that a Minister of Education should be appointed. With the growing feeling on the part of the public on this matter, if an opportunity presents itself of again bringing forward this proposal it will not be allowed to be dropped.

It is clear from Prof. Huxley's letter that the present machinery is not adequate: it can only be strengthened and consolidated by the appointment of a Minister. One enormous advantage of such a Minister would be that we should have an acknowledged Department to apply to, absolutely in sympathy with those who wish to bring about any improvement in our educational machinery. Quite recently we have had two deputations on purely educational matters: one, for an endowment to the Victoria University, to the Chancellor of the Exchequer, and the other, for further aid to technical education, to the Lord President. It is very difficult for a plain man to understand why the Chancellor of the Exchequer should have been chosen in one case and the Lord President in the other: of course there is an official reason, but it only adds point to the grotesqueness of the present arrangements.

We have, however, to refer to these deputations from another point of view. The prayer of the Victoria University has been granted: that the needed assistance in the other matter—technical instruction—will be granted at once is by no means certain. However this may be, well-wishers of science must thank Mr. Mundella for his vigorous pleading of the cause they have at heart.

The object of the last deputation, as Mr. Mundella pointed out, was to ask the Government to take a very modest step in the direction of the organisation of industrial and commercial education. The education of the 4,600,000 on the books of the elementary schools is confined to education of a purely elementary character, and anything in the shape of manual or industrial education is treated in a way very disheartening to those interested in the question. At present our industrial classes are like badly drilled soldiers fighting a battle with antiquated weapons—it is like sending our soldiers into the field, armed with Brown Bess, to meet the best armed soldiers of Europe. Dr. Konrad, in a report on the Prussian system in its bearing on the national economy, said the superiority of the Western to the Eastern workman, and of the German to the Englishman, was well established; and he added that no doubt the Englishman by his enormous perseverance and his wonted diligence got through considerably more work in the sphere to which he had been long accustomed, but he was far behind the German in capacity for adapting himself to new circumstances. This was the result of the better and more general training which the Germans got in their schools. Mr. Mundella acknowledged that there had been repeated attempts to do something in England to improve the condition of things, but where public bodies had interfered they had acted beyond their powers and been punished accordingly. It was freedom from the restrictions under which these authorities laboured that the deputation sought. They asked also for increased powers to promote industrial, scientific, and technical training, and that for this purpose they should be put in connexion with the Science and Art Department. The cost of executing what they proposed would be trifling.

Sir Lyon Playfair contended that a short Act of three clauses would do all that is wanted. We hope soon to see it. Sir B. Samuelson, as Chairman of the Associated Chambers of Commerce, presented a memorial from that body, and Mr. Howell hit the nail on the head by stating that for "unemployed," in connexion with our industrial population, now so often used, the word "unskilled" should be substituted.

We are bound to say that Lord Cranbrook's answer was sympathetic, but he is clearly of opinion that the Government can do nothing because "Parliament has not really pronounced on the subject of technical instruction"!

ROSENBUSCHS "PETROGRAPHY"

Mikroskopische Physiographie der massigen Gesteine. Von H. Rosenbusch. I. Abtheilung. Zweite gänzlich umgearbeitete Auflage. (Stuttgart, 1886.)

THE first part of the second edition of this important work has at length appeared, the author having wisely decided not to keep back this instalment until the whole has been completed. Petrography advances nowadays with such gigantic strides, and so quickly are new facts accumulated and new theories elaborated, that as soon as the last chapters of a treatise on this science have been written it is almost time to begin re-writing the first.

This book has been looked forward to by petrographers with a certain amount of pardonable impatience, in the hope that it would do something towards clearing away the mists that envelop rock-classification and nomenclature. Since the introduction of the polarising microscope into petrographical research, old familiar names—like greenstone, trap, felstone, trachyte, &c.—have either been discarded or materially modified in their use; and we now talk with Gümbel of lamprophyre, proterobase, picrophyre, palæophyre, palæopicrite, leucophyre, and the like; or we use names manufactured from the localities where the rocks are found, such as tonalite, ortlerite, or palatinite; or, lastly, following in the wake of the organic chemists, we construct complex names by stringing together those of the component minerals, as, for example, quartz-augite-diorite or hornblende-augite-mica-andesite. The result is that either different petrographers call the same rock by different names, or use the same name to designate different rocks. At the same time, so many views have arisen as to the fundamental elements of petrographical classification, that there are almost as many systems of classification as there are petrographers.

Up to the present time Continental geologists have been in the habit of making geological age a primary factor in classification. Now, although this may apply to Germany, it certainly will not hold for other countries. In England and America it has been shown conclusively that rocks identical in structure and composition have been formed in pre-Tertiary and Tertiary times.

The new edition of Rosenbusch's work would, it was hoped, bring order into this chaos, and give us a classification and nomenclature which, without being too rigid, would allow of referring any particular rock to its family. Such a classification, agreeing with all the known facts, would doubtless readily be accepted by all geologists in this country, were it only for the sake of uniformity and unanimity.

A brief review, or epitome, of Prof. Rosenbusch's book may not be unwelcome here. Any criticism had best be reserved until the work is completed. We owe, indeed, such a debt of gratitude to the author for collecting, collating, and arranging the vast quantity of facts which have been accumulating within the last few years, that it would be almost presumptuous to attempt to find fault with a work so excellent, so invaluable in every way.

In the introduction Prof. Rosenbusch gives us his views on classification. These differ very materially from those expressed in the former edition. "A natural system of classification must," he writes, "in the first place lay stress on the geological mode of occurrence (*geologische Erscheinungsform*), as determining structure and the mineral components. In the second place comes chemical composition, and, lastly, geological age." Secondary alteration in structure or mineralogical composition can have no classificatory value.

It is the geological mode of occurrence that almost exclusively determines the structure of an eruptive rock. Eruptive masses of the same chemical and mineralogical composition possess a totally different structure, according as they were poured out at the earth's surface in the form of lava, or consolidated in the deeper regions of the earth's solid crust. This may, of course, also be expressed by saying that the structure of a rock depends, *cæteris paribus*, only on the differences of temperature and pressure to which it has been subjected during its formation.

Classified, then, according to their mode of occurrence, eruptive rocks may be divided into two great groups: (1) the *Plutonic* rocks (*Tiefengesteine*); and (2) the *Volcanic* or *effusive* rocks (*Ergussgesteine*). Occupying an intermediate position between these two chief groups is a third—that of the rocks occurring in the form of dykes (*Ganggesteine*). Both plutonic and volcanic rocks are often found as dykes; but this group comprises those rocks which are found occurring alone in this form, and which possess certain structural peculiarities entitling them to be considered apart from the plutonic and effusive rocks. With regard to the latter it may be remarked that it is in this group that Prof. Rosenbusch does not feel justified in dropping altogether geological age as a classificatory factor. Accordingly these rocks are subdivided by him into *palæovolcanic* and *neovolcanic;* the former embracing those erupted in pre-Tertiary times, the latter those of Tertiary age.

In the introductory chapter to the plutonic rocks Prof. Rosenbusch treats of the structure and order of crystallisation of the mineral components of these rocks. In this chapter he embodies the substance of his paper on the granular and porphyritic structure of massive rocks, published some time since in the *Neues Jahrbuch.* In that paper he showed how in an eruptive silicate-magma the minerals separate in the order of decreasing basicity, so that at any given moment the uncrystallised magma is more acid than the sum of the separated compounds. Further, that the relative masses of the compounds present in such a magma act only in so far on the order of their separation, that generally those present in less quantity crystallise out first. To facilitate petrographical expression, Prof. Rosenbusch has proposed a couple of words which appear to be worthy of general acceptation. He calls those mineral components which occur in individuals, bounded on all sides by crystallised faces, *idiomorphic; allotriomorphic,* those which owe their boundaries to causes other than an internal arrangement of the molecules composing them. Applying this to the plutonic rocks, he points out that, whereas certain rocks, occurring as dykes, possess a "panidiomorphic granular" structure, the plutonic rocks are characterised by a granular structure essentially "hypidiomorphic" (a part of the minerals only possessing their own crystallographic form).

The group of the Plutonic rocks is subdivided by Prof. Rosenbusch as follows:—

(*a*) Family of the granitic rocks.
(*b*) Family of the syenitic rocks.
(*c*) Family of the elæolite syenites.
(*d*) Family of the diorites.
(*e*) Family of the gabbros and norites.
(*f*) Family of the diabases.
(*g*) Family of the theralites.
(*h*) Family of the peridotites.

Among these we notice a new name—the *theralites.* Under this head are included the plagioclase-nepheline rocks, formerly represented by the teschenites. The latter have been shown by Rohrbach (Tschermak's *Min und Pet. Mitt.*, 1885, ii. 1-63) to contain no nepheline, and have consequently been referred by him partly to the diorites, partly to the diabases. Still, plutonic rocks representing this mineralogical combination appear to exist (*e.g.* in the Crazy Mountains in Montana, U.S.); and thus the gap left by the removal of the teschenites is filled up. Prof. Rosenbusch derives the name theralite from θηρᾶν (to seek eagerly).

The group that embraces the rocks occurring in the form of dykes, is subdivided, according to mineralogica and chemical composition, into a *granitic*, a *syenitic*, and a *dioritic* series.

Looking at the rocks, however, from the point of view of habit and structure, three types, independent of mineralogical composition, may be established, namely: a "*granitic*," only known to occur among the more acid representatives; a "*granito-porphyritic*," which is represented in each of the above series; and a "*lamprophyric*," which appears to be unrepresented in the more acid subdivisions. The following classification is accordingly proposed for the "dyke-rocks":—

(*a*) Granitic dyke-rocks (aplite, tourmaline-granite, &c.).

(*b*) Granito-porphyritic dyke-rocks (granite-porphyry, syenite-porphyry, elæolite-porphyry, diorite-porphyrite).

(*c*) Lamprophyric dyke-rocks.

This last family may perhaps be best designated as a refuge for certain classes of rocks, such as the kersantites and kersantons, the minettes, and the lamprophyres, which have been long wandering about in the various systems of classification without finding any fixed abode. It is further subdivided into the syenitic lamprophyres (minettes and vogesites) and the dioritic lamprophyres (kersantite and camptonite).

Passing on to the group of the true Volcanic rocks, we note an important distinction between them and those of the Plutonic group, contained in a general law laid down by the author in this chapter. A volcanic (effusive) rock is always more acid and specifically lighter than its plutonic equivalent. To explain this the author suggests that an eruptive magma, during its slow ascent along cracks in the earth's crust, differentiates according to specific gravity, the heavier part, which ultimately gives rise to the plutonic rocks that consolidate within the earth's crust, being more basic, poorer in alkalies, and richer in alkaline earths and iron, than the specifically lighter part which reaches the earth's surface.

The author then proceeds to discuss the recurrence of phase in the crystallisation of the effusive rocks, and defines porphyritic structure as that structure which is produced by the recurrence of the same or similar minerals at two distinct periods of crystallisation. It is this structure which is the most essential characteristic of the effusive rocks. It may, however, be developed in very different ways. When the ground-mass is holocrystalline, the structure is "holocrystalline-porphyritic"; it is "vitro-porphyritic" when the ground-mass is glassy, and "hypocrystalline-porphyritic" when the ground-mass consists partly of vitreous, partly of crystalline elements.

Of the Volcanic group only the palæovolcanic series is discussed in the present volume. It is subdivided as follows:—

(*a*) Family of the quartz porphyries (palæovolcanic equivalents of the granites).

(*b*) Family of the quartzless porphyries (equivalents of the syenites).

(*c*) Family of the porphyrites (equivalents of the diorites).

(*d*) Family of the augite-porphyrites and melaphyres equivalents of the gabbros and diabases).

(*e*) Family of the picrite-porphyrites (equivalents of the peridotites).

The neovolcanic rocks (rhyolites, trachytes, andesites, basalts, phonolites, tephrites, &c.) are reserved for the Second Part, which is promised for Easter of this year, and will contain the plates to the whole volume. Thus completed, the work will form a most valuable addition to petrographical literature. One of its important features is the full collation of literature under each head. Students of petrographical science will thank Prof. Rosenbusch for the inestimable boon he has conferred upon them in indexing almost all the papers dealing with petrographical subjects which had appeared up to the date of publication of his book.

FREDERICK H. HATCH

LOCH CRERAN

Loch Creran: Notes from the Western Highlands. By W. Anderson Smith. (Paisley and London: Alexander Gardner, 1887.)

THE amateur naturalist who has leisure, a genuine interest in his subject, and abundant opportunities of exercising his observation, ought to be an exceptionally happy person; but he is not always well-advised in rushing into print with the result of his fugitive studies. That, however, is one of the foibles of the hour. The public are supposed to welcome somewhat bald catalogues of the common objects of the way-side, the heath, and the sea-shore; the newspaper reporter is glad to be temporarily withdrawn from the Divorce Court and sent to describe the chestnut-trees in Bushey Park; and young ladies, who have got the length of distinguishing between *Ranunculus Ficaria* and *R. acris* narrate in the evening papers the story of their exploration of the hedgerows. The result is harmless enough. It is not science; it is not literature; but it serves to teach a few people here and there to keep their eyes open; and that is something. And perhaps a world groaning under a load of books need not mind an additional volume or two—which it is not compelled to read.

Mr. W. Anderson Smith does not inform us whether these "Notes from the Western Highlands" have been, like some other of his writings, reprinted from a provincial journal; but if they are so, he has done himself injustice in not stating the fact; for carelessness that is comparatively venial in the columns of a newspaper becomes vexatious in a book. And truth compels us to say that Mr. Smith's style is slovenly in the extreme. Mis-spellings abound; the few scraps of French or Latin quoted are almost invariably mangled; there is an occasional lapse of grammar; and now and again the heedless composition provokes a smile, as when he says, "Into the luxurious beds we sink up to the knees, many of them at present with dainty seed-vessels ripe and full." And yet there is a chatty simplicity here and there in the book that is not without attraction. The ways and humours of certain domestic pets are described in a kindly fashion which recommends itself; and there are incidental glimpses of winter life and winter occupations in the West Highlands that are sufficiently pleasant. As for the bulk of the volume, that is devoted to marine zoology; and marine zoology, to be made interesting, not to say intelligible, to the general reader, should be accompanied by illustrations; while, on the other hand, the trained scientific student is not likely to concern himself much with the unmethodical investigations here noted down.